

Claims

What is claimed is:

1. A dressing tool suitable for conditioning a fixed abrasive CMP pad, comprising:
5 a substrate having a working surface with a plurality of small projections thereon.
2. The dressing tool of claim 1, wherein the projections have a height that is equal to or less than the height of poles contained on a fixed abrasive CMP pad to be conditioned.
- 10 3. The dressing tool of claim 1, wherein the projections each have a height of equal to or less than about 30 micrometers, and are spaced apart from one another for a distance of equal to or less than about 150 micrometers.
- 15 4. The dressing tool of claim 1, wherein the projections each have a height that extends to within plus or minus 5 micrometers of a fixed horizontal plain that is substantially parallel to the substrate.
5. The dressing tool of claim 1, wherein the projections have a substantially uniform
20 height, and are substantially uniformly spaced apart from one another.
6. The dressing tool of claim 1, wherein the projections each have a pyramid shape.

7. The dressing tool of claim 1, wherein the substrate and projections comprise a ceramic material.

8. The dressing tool of claim 7, wherein the ceramic material is a member selected
5 from the group consisting of: aluminum oxide, silicon oxide, zirconium oxide, silicon
carbide, silicon nitride, boron nitride, and mixtures thereof.

9. The dressing tool of claim 8, wherein the ceramic material is either a silicon
carbide, or a cemented tungsten carbide.

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10. The dressing tool of claim 1, wherein the substrate and projections comprise a metallic material.

11. The dressing tool of claim 10, wherein the metallic material includes at least one
15 member selected from the group consisting of: chromium, steel, stainless steel, tantalum,
titanium, tungsten, zirconium, and alloys thereof.

12. The dressing tool of claim 11, wherein the metallic material is stainless steel.

20 13. The dressing tool of either claim 7 or 10, further comprising a layer of a
carbonaceous material formed over the working surface.

14. The dressing tool of claim 13, wherein the carbonaceous material is made substantially of a member selected from the group consisting essentially of: diamond, polycrystalline diamond, diamond-like carbon, and mixtures thereof.

5 15. The dressing tool of claim 14, wherein the carbonaceous material is polycrystalline diamond.

16. The dressing tool of claim 14, wherein the carbonaceous material is diamond-like carbon.

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17. The dressing tool of claim 13, wherein the layer of carbonaceous material has a thickness of from about 0.1 micrometer to about 10 micrometers.

18. The dressing tool of claim 13, wherein the carbonaceous layer has a working
15 surface that inversely corresponds to the interface surface of an ephemeral mold.

19. A dressing tool suitable for conditioning a fixed abrasive CMP pad, comprising:
a substrate having a working surface;
a plurality of uniformly spaced apart small projections of uniform height formed
20 on the working surface; and
a carbonaceous layer formed over the working surface and plurality of projections.

20. The dressing tool of claim 19, wherein the substrate and plurality of small

projections are made substantially of a ceramic material.

21. The dressing tool of claim 19, wherein the substrate and plurality of small projections are made substantially of a metallic material.

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22. The dressing tool of claim 19, wherein the plurality of small projections each have a height of less than about 30 micrometers, and are spaced apart from one another for a distance of less than about 150 micrometers.

10 23. A dressing tool suitable for conditioning a fixed abrasive CMP pad, comprising:
a substrate; and
a carbonaceous layer coupled to the substrate, said carbonaceous layer having a working surface with plurality of small projections which inversely correspond to the configuration of an interface surface of an ephemeral mold, upon which the carbonaceous
15 layer was formed.

24. The dressing tool of claim 23, wherein the projections have a uniform height of less than about 30 micrometers, and are uniformly spaced apart from one another for a distance of less than about 150 micrometers.

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25. The dressing tool of claim 23, wherein the substrate is made substantially of a metallic material.

26. The dressing tool of claim 23, wherein the substrate is made substantially of a ceramic material.

27. A method of making a dressing tool that is suitable for conditioning a fixed
5 abrasive CMP pad, comprising the steps of:

providing a substrate having a working surface; and

forming a plurality of small projections on the working surface.

28. The method of claim 27, wherein the projections have a height of less than about
10 30 micrometers, and are spaced apart from one another for a distance of less than about
150 micrometers.

29. The method of claim 27, wherein the projections are substantially uniform in
height, and substantially uniformly spaced apart.

30. The method of claim 27, wherein the substrate is made substantially of a metallic
15 material.

31. The method of claim 27, wherein the substrate is made substantially of a ceramic
20 material.

32. The method of claim 27, further comprising the step of:

forming a carbonaceous layer over the working surface.

33. The method of claim 32, wherein the carbonaceous layer is a member selected from the group consisting of: diamond, polycrystalline diamond, diamond-like carbon,
5 and mixtures thereof.

34. The method of claim 32, wherein the carbonaceous layer is made substantially of either diamond or polycrystalline diamond, and is formed using a chemical vapor deposition (CVD) technique.

35. The method of claim 32, wherein the carbonaceous layer is made substantially of diamond like carbon, and is formed using a physical vapor deposition (PVD) technique.

36. The method of claim 32, wherein the diamond-like carbon is amorphous diamond.

37. A method of making a dressing tool that is suitable for conditioning a fixed abrasive CMP pad, comprising the steps of:

providing a mold having an interface surface with a plurality of small concavities inversely matching a plurality of small projections intended for a working surface of the
20 tool;

growing a carbonaceous layer on the interface surface using a deposition technique;

coupling the carbonaceous layer to a substrate; and

removing the mold to expose the working surface.

38. The method of claim 37, wherein the substrate is made substantially of a metallic material.

5 39. The method of claim 37, wherein the substrate is made substantially of a ceramic material.

40. The method of claim 37, wherein the carbonaceous layer is a member selected from the group consisting of: diamond, polycrystalline diamond, diamond-like carbon,
10 and mixtures thereof.

41. The method of claim 40, wherein the carbonaceous layer is made substantially of either diamond or polycrystalline diamond, and is formed using a chemical vapor deposition (CVD) technique.

15 42. The method of claim 40, wherein the carbonaceous layer is made substantially of diamond like carbon, and is formed using a physical vapor deposition (PVD) technique.

43. The method of claim 40, wherein the diamond-like carbon is amorphous diamond.

20 44. The method of claim 37, wherein the projections have a height of less than about 30 micrometers, and are spaced apart from one another for a distance of less than about 150 micrometers.

45. The method of claim 44, wherein the projections are uniform in height, and uniformly spaced apart.

5 46. A method of conditioning a fixed abrasive CMP pad comprising the steps of:
providing a dressing tool having a substrate with a working surface having a plurality of small projections; and
applying the working surface against a polishing surface of the fixed abrasive CMP pad during rotation of the CMP pad.

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47. The method of claim 46, further comprising the step of rotating the dressing tool during application thereof to the fixed abrasive CMP pad.

15 48. The method of claim 47, wherein the projections have a height that is equal to or less than a height of poles contained on the fixed abrasive CMP.

49. The method of claim 47, wherein the projections each have a height of less than about 30 micrometers, and are spaced apart from one another for a distance of less than about 150 micrometers.

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50. The method of claim 47, wherein the projections have a uniform height, and are uniformly spaced apart from one another.

